

What is claimed is:

1. 1. A method for identifying a defocus wafer, comprising the steps of:
  2. collecting data by mapping a topography of each wafer in a first wafer batch;
  3. calculating a focus spot deviation from the data, the focus spot deviation corresponding to a height by which a focus spot of a photo exposure module would be defocused by the topography;
  4. updating a process control chart with the focus spot deviation;
  5. converting the focus spot deviation to a corresponding wafer stage set point to which the photo exposure module is set, to focus the focus spot on each wafer in a present or current wafer batch; and
  6. identifying a defocus wafer in the present or current wafer batch, as a wafer having a topography that would defocus the focus spot, even when the photo exposure module is set to the wafer stage set point that corresponds with the focus spot deviation.
10. 2. The method of claim 1, further comprising the step of:
  2. resetting the photo exposure module to a corrected wafer stage set point to focus the focus spot on the defocus wafer.
1. 3. The method of claim 1, further comprising the steps of:
  2. resetting the photo exposure module to a corrected wafer stage set point to focus the focus spot on the defocus wafer; and
  4. photo exposing the topography of the defocus wafer by the photo exposure module that is reset to the corrected wafer stage set point.
1. 4. The method of claim 1, further comprising the steps of:
  2. resetting the photo exposure module to a corrected wafer stage set point to focus the focus spot on the defocus wafer, during a process of photo exposing the topography of the wafers in the next succeeding batch by the photo exposure module; and
  5. photo exposing the topography of the defocus wafer by the photo exposure module that is reset to a corrected wafer stage set point.

- 1    5.    The method of claim 4, further comprising the step of:
  - 2       calculating an updated focus spot deviation that corresponds to a height by which a focus
  - 3       spot of a photo exposure module would be defocused by the topography of the wafers in the next
  - 4       succeeding batch; and
- 5       updating the process control chart with the updated focus spot deviation.
- 1    6.    The method of claim 1, further comprising the step of:
  - 2       supplying the focus spot deviation as a wafer gating signal identifying the defocus wafer
  - 3       to a gating mechanism of the photo exposure module.
- 1    7.    The method of claim 1, further comprising the steps of:
  - 2       scanning the topography of each wafer in the first wafer batch to obtain scan data in the
  - 3       form of height measurements per unit area of each wafer in the first wafer batch; and
  - 4       calculating the focus spot deviation from the scan data.
- 1    8.    The method of claim 1, further comprising the steps of:
  - 2       scanning the topography of each wafer in the first wafer batch with a level sensor
  - 3       apparatus to obtain scan data in the form of height measurements per unit area of each wafer in
  - 4       the first wafer batch;
  - 5       assembling the scan data in a database; and
  - 6       calculating the focus spot deviation from the scan data.
- 1    9.    The method of claim 1, further comprising the steps of:
  - 2       scanning the topography of each wafer in the present or current wafer batch to obtain
  - 3       scan data in the form of height measurements per unit area;
  - 4       identifying the defocus wafer by its scan data; and
  - 5       resetting the photo exposure module to a corrected wafer stage set point to focus the
  - 6       focus spot on the defocus wafer.
- 1    10.   The method of claim 1, further comprising the steps of:

2           scanning the topography of each wafer in the present or current wafer batch with a level  
3 sensor apparatus to obtain scan data in the form of height measurements per unit area;  
4           identifying the defocus wafer by its scan data; and  
5           resetting the photo exposure module to a corrected wafer stage set point to focus the  
6 focus spot on the defocus wafer.

1       11.   The method of claim 1, further comprising the steps of:  
2           scanning the topography of each wafer in the next succeeding wafer batch to obtain scan  
3 data in the form of height measurements per unit area of each wafer in the next succeeding wafer  
4 batch;  
5           identifying the defocus wafer by its scan data;  
6           resetting the photo exposure module to a corrected wafer stage set point to focus the  
7 focus spot on the defocus wafer, during a process of photo exposing the topography of the wafers  
8 in the next succeeding batch; and  
9           photo exposing the topography of the defocus wafer by the photo exposure module that is  
10 reset to a corrected wafer stage set point.

1       12.   The method of claim 11, further comprising the step of:  
2           calculating an updated focus spot deviation that corresponds to a height by which a focus  
3 spot of a photo exposure module would be defocused by the topography of the wafers in the next  
4 succeeding batch; and  
5           updating the process control chart with the updated focus spot deviation.

1       13.   The method of claim 1, further comprising the steps of:  
2           scanning the topography of a photo resist material covering patterned dies on the wafers  
3 in the present or current wafer batch to obtain scan data in the form of height measurements per  
4 unit area;  
5           identifying the defocus wafer by its scan data; and  
6           resetting the photo exposure module to a corrected wafer stage set point to focus the  
7 focus spot on the defocus wafer.

1    14.    The method of claim 13, further comprising the steps of:  
2        scanning the topography of the photo resist material covering the patterned dies with a  
3        scanner having multiple sensors; and  
4        obtaining valid scan data only when all of the multiple scanning sensors simultaneously  
5        cover the patterned dies.

1    15.    The method of claim 14, further comprising the steps of:  
2        calculating an updated focus spot deviation corresponding to a height amount by which a  
3        further wafer batch would defocus the focus spot;  
4        updating the process control chart with the updated focus spot deviation.

1    16.    A method of using a level sensor apparatus to identify a defocus wafer, comprising the  
2        steps of:  
3        scanning a topography of each wafer in the first wafer batch with a level sensor apparatus  
4        to obtain scan data in the form of height measurements per unit area of each wafer in the first  
5        wafer batch;  
6        calculating a focus spot deviation from the scan data;  
7        updating a process control chart with the focus spot deviation;  
8        converting the focus spot deviation to a corresponding wafer stage set point to which the  
9        photo exposure module is set, to focus the focus spot on each wafer in a present or current wafer  
10      batch;  
11      scanning the topography of each wafer in a next succeeding wafer batch with the level  
12      sensor apparatus to obtain scan data in the form of height measurements per unit area of each  
13      wafer in the next succeeding wafer batch;  
14      identifying a defocus wafer by its scan data;  
15      resetting the photo exposure module to a corrected wafer stage set point to focus the  
16      focus spot on the defocus wafer, during a process of photo exposing the topography of the wafers  
17      in the next succeeding batch; and  
18      photo exposing the topography of the defocus wafer by the photo exposure module that is  
19      reset to a corrected wafer stage set point.

1    17.    The method of claim 16, further comprising the steps of:  
2         assembling the scan data in a database that calculates the focus spot deviation as a  
3         statistical deviation from a high frequency occurrence of the height measurements per unit area.

1    18.    The method of claim 16, further comprising the steps of:  
2         scanning the topography of a photo resist material covering patterned dies on the wafers  
3         in a present or current wafer batch with the level sensor apparatus to obtain scan data in the form  
4         of height measurements per unit area;  
5         identifying the defocus wafer by its scan data; and  
6         resetting the photo exposure module to a corrected wafer stage set point to focus the  
7         focus spot on the defocus wafer.

1    19.    The method of claim 18, further comprising the steps of:  
2         scanning the topography of the photo resist material covering the patterned dies with the  
3         level sensor apparatus having multiple sensors; and  
4         obtaining valid scan data only when all of the multiple scanning sensors simultaneously  
5         cover the patterned dies under the photo resist material.

1    20.    The method of claim 19, further comprising the steps of:  
2         resetting the photo exposure module to a corrected wafer stage set point to focus the  
3         focus spot on the defocus wafer, during a process of photo exposing the topography of the wafers  
4         in the next succeeding batch; and  
5         photo exposing the topography of the defocus wafer by the photo exposure module that is  
6         reset to a corrected wafer stage set point.

1    21.    A system for identifying a defocus wafer, comprising:  
2         a level sensor creating mapping data of a topography of each wafer in a first wafer batch;  
3         a process control chart updated with a focus spot deviation calculated from the mapping  
4         data, the focus spot deviation corresponding to a height by which a focus spot of a photo  
5         exposure module would be defocused by the topography;

6           a photo exposure module set to a corresponding wafer stage set point corresponding to  
7   the focus spot deviation, to focus the focus spot on each wafer in a present or current wafer  
8   batch; and

9           means for identifying a defocus wafer in the present or current wafer batch, as a wafer  
10   having a topography that would defocus the focus spot, even when the photo exposure module is  
11   set to the wafer stage set point that corresponds with the focus spot deviation.

1   22.   The system of claim 21, wherein, the photo exposure module is resettable to a corrected  
2   wafer stage set point to focus the focus spot on the defocus wafer.

1   23.   The system of claim 21, wherein, the level sensor has multiple topography scanners.

1   24.   The system of claim 21, wherein, the topography each wafer corresponds to the  
2   topography of patterned dies.on each wafer.